



Singhisporites rajmahalensis sp. nov. - A new megaspore species from Barakar Formation, Rajmahal Basin, Jharkhand

Arun Joshi^{1, 2}

1. Yong Scientist (P.I.), Science and Engineering Research Board, India

2. Assistant Professor, S.G.R.R. (P.G.) College, Dehradun, India

Corresponding Address:

Dr. Arun Joshi

H.No. 39 Lane- II Sadbhav Kunj,

Panditwari, P.O.Premnagar,

Dehradun -248007

(Uttarakhand)

India.

Email: arunjoshi119@gmail.com

Article History

Received: 02 May 2018

Accepted: 12 June 2018

Published: June 2018

Citation

Arun Joshi. *Singhisporites rajmahalensis* sp. nov. - A new megaspore species from Barakar Formation, Rajmahal Basin, Jharkhand. *Species*, 2018, 19, 36-40

Publication License



© The Author(s) 2018. Open Access. This article is licensed under a [Creative Commons Attribution License 4.0 \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).

General Note



Article is recommended to print as color digital version in recycled paper.

ABSTRACT

A new gulate megaspore species namely *Singhisporites rajmahalensis* sp. nov. recovered from the carbonaceous shale samples collected from the Barakar Formation, Early Permian, Rajmahal Open Cast Mine, Rajmahal Basin, Jharkhand is being systematically

described here. The megaspore is subcircular to circular, exosporium spinate, spines are densely distributed- single, bi and multifurcate uniformly distributed, straight to curve. The present find is significant as it represents the existence of lycopsids in the area during its deposition. Hence, enlarge the phytogeographic distribution of this genus and widens the scope of use of this genus as one of the characteristic forms of the Barakar Formation of Early Permian age.

Keywords: Shale, Barakar Formation, Rajmahal Basin, megaspore, Early Permian

1. INTRODUCTION

The Rajmahal Basin is a master Basin which encompasses a large area of Bengal Basin, north Bengal and Purnea Basin (Joshi, 2018). The present study deals with a new gulate megaspore namely *Singhisporites rajmahalensis* from the Rajmahal Open Cast Mine, Rajmahal Basin, Jharkhand. Megaspores are the female gamete cells which give rise to female gametophyte in the early land plants mainly the lycopsids and sphenopsids. The presence of micro and megaspores indicate heterospory which is advancement in the evolutionary history of the early land plants (Joshi, 2016). Here the presence of gulate and spinate megaspore signifies the favourable conditions responsible for the development of these early land plants in the study area.

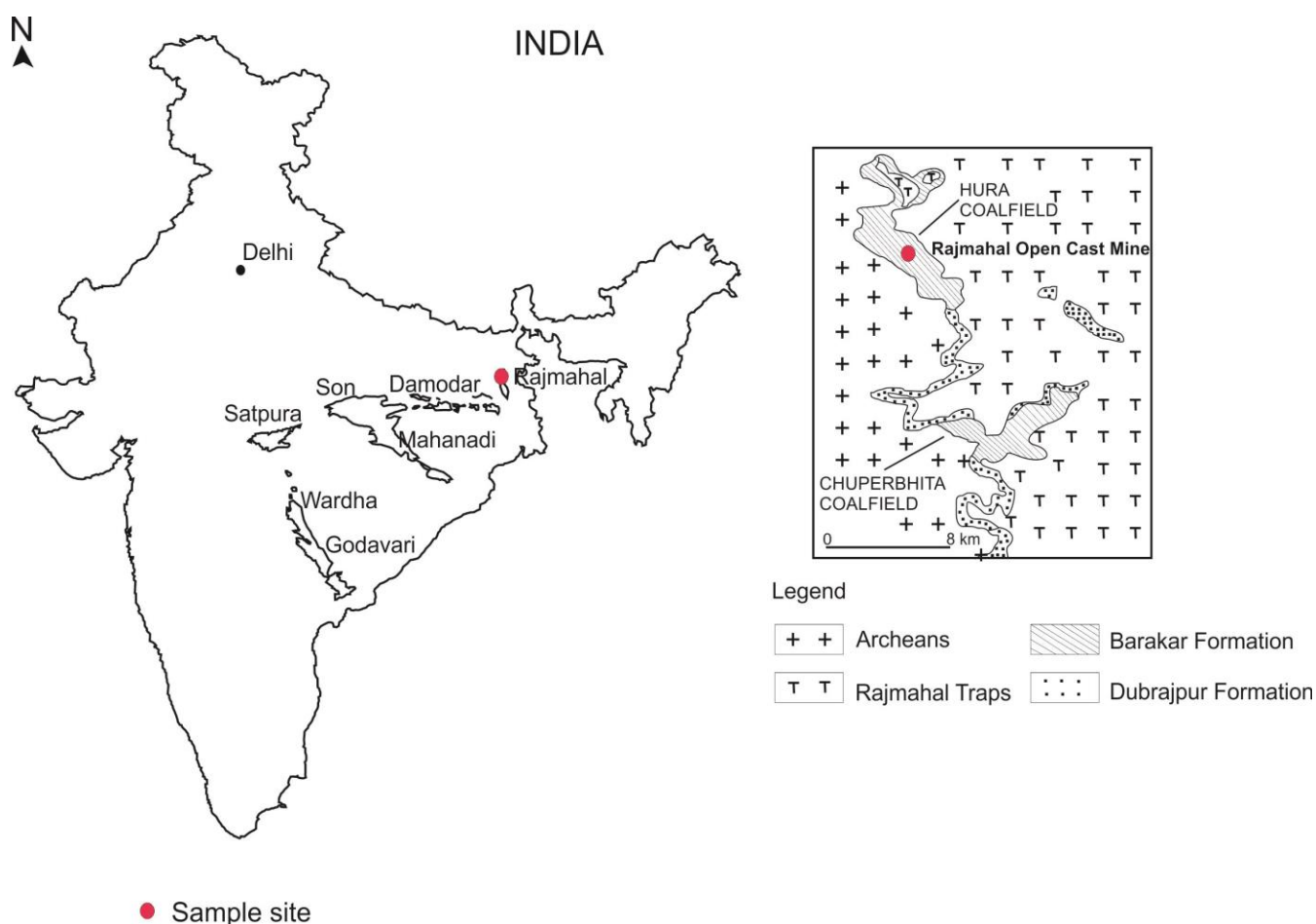


Figure 1 Map showing sample site (after Joshi, 2018).

2. MATERIAL AND METHODS

Megaspores were recovered from the carbonaceous shale samples collected from the Barakar Formation, Rajmahal Open Cast Mine, Rajmahal Basin, Jharkhand (Figs 1 & 2). For the recovery of megaspores, the samples were processed with concentrate hydrofluoric acid for 5–7 days and washed thoroughly with water. Megaspores were picked individually and kept in conc. HNO_3 for 10–12 hours. A pinch of KClO_3 was added to catalyze the reaction. When the megaspores turned brown, they were thoroughly washed with water.

and then treated with 5% potassium hydroxide (KOH) solution which revealed the exosporium features like shape, nature of triradiate mark, contact ridges, ornamentation and the mesosporium. Megaspores were observed under low power binocular microscope Olympus CH-20i. The slides have been deposited in the Botany Department SGRR (P.G.) College, Dehradun.

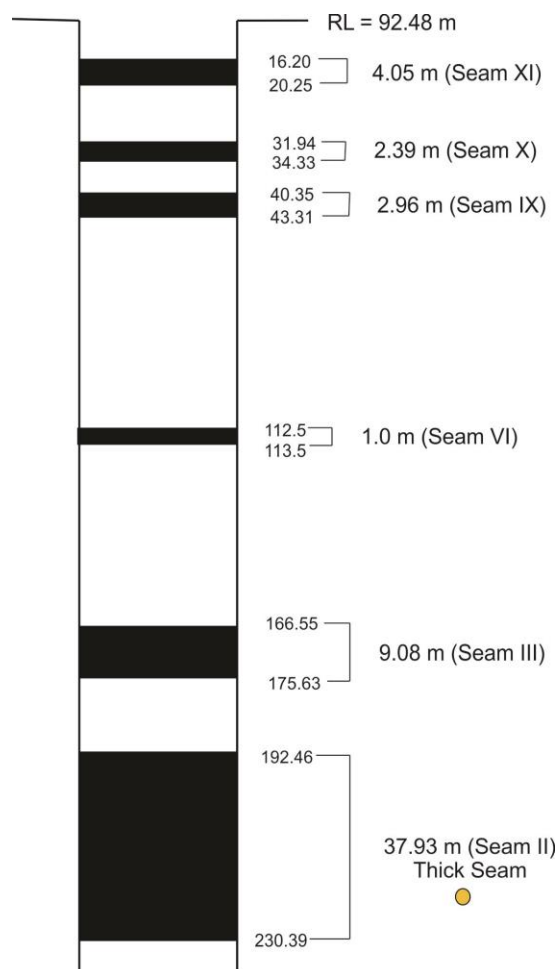


Figure 2 Litholog of the Rajmahal Open Cast Mine, Rajmahal Basin (after Joshi, 2018).

● = Megaspore.

3. SYSTEMATIC DESCRIPTION

Genus: *Singhisporites* (Potonié, 1956) Bharadwaj and Tiwari, 1970

Type species: *Singhisporites surangei* (Potonié, 1956) (= *Triletes surangei* Singh, 1953 in Surange et al. 1953) Bharadwaj and Tiwari, 1970

Singhisporites rajmahalensis Joshi sp. nov. (Fig. 3)

Age: Barakar Formation, Early Permian, Rajmahal Open Cast Mine, Rajmahal Basin, Jharkhand, India.

Etymology: After Rajmahal Open Cast Mine, Rajmahal Basin.

Diagnosis: Megaspore circular to subcircular in shape, exosporium spinate, spines simple, single, bifurcate and multifurcate, ornamentation dense, spines straight to curved, uniformly distributed; mesosporium indistinct, haline, apparently rounded and without cushions.

Description: The specimen is sub circular to circular. Tri-radiate and arcuate ridges are not seen, exosporium spinate, spines densely distributed- single, bi and multifurcate uniformly distributed, straight to curved. Differential maceration in conc. HNO_3 and 5% KOH reveals a hyaline spherical mesosporium. Gula is present at the top of the spore.

Dimensions: Overall size 760-820 μm , length of spines 175- 300 μm , width of spines at base 34-45 μm , width of spines at apex 16–21 μm , diameter of mesosporium 624 x 648 μm . Gula about 102-110 μm in length, width at apex 45-60 μm and at base 100-105 μm .

Remarks: *Singhisporites rajmahalensis* sp. nov. differs from the major known species of the genus *Singhisporites*, viz., *S. indica*, *S. nautiyalii*, *S. radialis*, *S. surangei*, *Singhisporites* sp. (Joshi & Tewari, 2015, Pl.2, Figs 3,4; Pl.2, Figs 5,6; Pl.3, Figs 2-6, Pl.4, Figs 1-4; Pl.4, Figs 5,6 respectively and the references cited in it).

Holotype: SGRR Slide No. RJ/5.

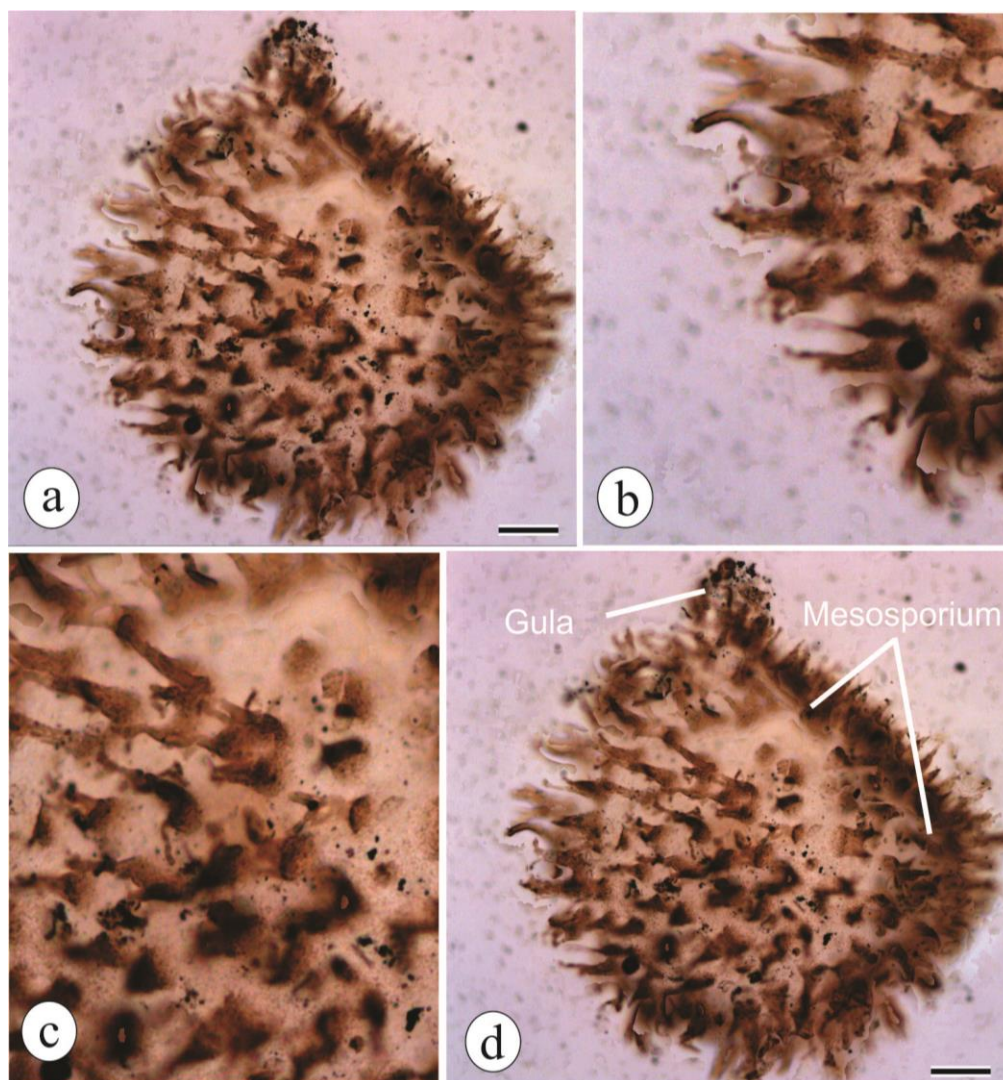


Figure 3 Scale bar = 100 μm (a) *Singhisporites rajmahalensis* Joshi sp. nov.; SGRR Slide No. RJ/5. (b, c) A portion of megaspore in 'a' enlarges ($\times 3.5$, $\times 5$ respectively) to show ornamentation. (d) Megaspore 'a' to show gula and mesosporium.

4. CONCLUSION

Presence of new species viz. *Singhisporites rajmahalensis* adds to the existing knowledge of megaspores in the Rajmahal Basin. The dense spinate and gulate megaspore indicates favourable environmental conditions i.e. aquatic fresh water condition for the germination of the megaspores (Joshi, 2016). The nature of gula is not known. This is not produced in any living heterosporous plants, although it can be compared with germinated megaspores and hence, 'gula' is a germ tube which emerges from the spore by rupturing the spore coat or the sexine for germination (Jha & Tewari, 2006). Occurrence of such megaspore is significant as it is the first report of gulate megaspore from the Rajmahal Basin. The present find is also significant as it represents the existence of lycopsids in the area during its deposition. Hence, enlarge the phytogeographic distribution of this genus and widens the scope of

use of this genus as one of the characteristic forms of the Barakar Formation of Early Permian age. More efforts are required for the recovery of megaspores in the area for better understanding of their vertical distribution and diversity.

ACKNOWLEDGEMENTS

The author is grateful to Science and Engineering Research Board (Department of Science and Technology) Government of India for providing financial assistance under Young Scientist Scheme (NPDF/2016/001701); to Mr. S. A. Yadav, CM (P)/ APM, Rajmahal Area, Eastern Coalfields Limited for granting permission to visit the colliery and for providing necessary help during field trip; to Principal S.G.R.R. (P.G.) College Dehradun for his kind cooperation to carry out this research work.

Funding: This research was funded by Science and Engineering Research Board (Department of Science and Technology) Government of India for providing financial assistance under Young Scientist Scheme (NPDF/2016/001701).

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCE

1. Joshi A. In situ occurrence of *Vertebraria indica* from the Rajmahal Open Cast Mine, Rajmahal Basin, India: an evidence for coal forming vegetation. *Journal of Terrestrial and Marine Research*, 2018; 2(1): 12-16.
2. Joshi A. The Glossopteris flora of Manuguru Area, Godavari Graben: palaeoecological implications, evolutionary perspectives and basinal correlation. Ph.D. Thesis, H.N.B. Garhwal, Central University, India, 2016: 204.
3. Potonié R. Synopsis der Gattungen der sporae dispersae, pt. 1. Beihefte zum Geologischen Jahrbuch, 1956: 23: 1–103.
4. Singh P. Megaspores from the Pindra Coal Seam: Part 1. In: Surange KR, Singh P & Srivastava PN (Editors)-Megaspores from West Bokaro Coalfield (Lower Gondwanas) of Bihar. *The Palaeobotanist*, 1953; 2: 10–13.
5. Surange KR, Singh P, Srivastava PN. Megaspores from the West Bokaro Coalfield (Lower Gondwana) of Bihar. *The Palaeobotanist*, 1953; 2: 9–17.
6. Bharadwaj DC, Tiwari RS. Lower Gondwana megaspores– A monograph. *Palaeontographica*, 1970: 129: 1–70.
7. Joshi A, Tewari R. Early Permian megaspores from Goutham Khani Open Cast Mine, Kothagudem Area, Godavari Graben, Telangana, India. *The Palaeobotanist*, 2015; 64: 139- 150.
8. Jha N, Tewari R. A comment on Gula and Gulate megaspores. *Current Science*, 2006; 91 (8): 1010-1011.